Quantum Quasi-Paradoxes and Quantum Sorites Paradoxes

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There can be generated many paradoxes or quasi-paradoxes that may occur from the combination of quantum and non-quantum worlds in physics. Even the passage from the micro-cosmos to the macro-cosmos, and reciprocally, can generate unsolved questions or counter-intuitive ideas. We define a quasi-paradox as a statement which has a *prima facie* self-contradictory support or an explicit contradiction, but which is not completely proven as a paradox. We present herein four elementary quantum quasi-paradoxes and their corresponding quantum Sorites paradoxes, which form a class of quantum quasi-paradoxes.

1 Introduction

According to the Dictionary of Mathematics (Borowski and Borwein, 1991 [1]), the **paradox** is "an apparently absurd or self-contradictory statement for which there is *prima facie* support, or an explicit contradiction derived from apparently unexceptionable premises". Some paradoxes require the revision of their intuitive conception (Russell's paradox, Cantor's paradox), others depend on the inadmissibility of their description (Grelling's paradox), others show counter-intuitive features of formal theories (Material implication paradox, Skolem Paradox), others are self-contradictory — Smarandache Paradox: "All is <A> the <Non-A> too!", where <A> is an attribute and <Non-A> its opposite; for example "All is possible the impossible too!" (Weisstein, 1998 [2]).

Paradoxes are normally true and false in the same time.

The **Sorites paradoxes** are associated with Eubulides of Miletus (fourth century B. C.) and they say that there is not a clear frontier between visible and invisible matter, determinist and indeterminist principle, stable and unstable matter, long time living and short time living matter.

Generally, between <A> and <Non-A> there is no clear distinction, no exact frontier. Where does <A> really end and <Non-A> begin? One extends Zadeh's "fuzzy set" concept to the "neutrosophic set" concept.

Let's now introduce the notion of quasi-paradox:

A **quasi-paradox** is a statement which has a *prima facia* self-contradictory support or an explicit contradiction, but which is not completely proven as a paradox. A quasi-paradox is an *informal* contradictory statement, while a paradox is a *formal* contradictory statement.

Some of the below quantum quasi-paradoxes can later be proven as real quantum paradoxes.

2 Quantum Quasi-Paradoxes and Quantum Sorites Paradoxes

The below quasi-paradoxes and Sorites paradoxes are based on the antinomies: visible/invisible, determinist/indeterminist, stable/unstable, long time living/short time living, as well as on the fact that there is not a clear separation between these pairs of antinomies.

2.1.1 **Invisible Quasi-Paradox:** Our visible world is composed of a totality of invisible particles.

2.1.2 **Invisible Sorites Paradox:** There is not a clear frontier between visible matter and invisible matter.

(a) An invisible particle does not form a visible object, nor do two invisible particles, three invisible particles, etc. However, at some point, the collection of invisible particles becomes large enough to form a visible object, but there is apparently no definite point where this occurs.

(b) A similar paradox is developed in an opposite direction. It is always possible to remove a particle from an object in such a way that what is left is still a visible object. However, repeating and repeating this process, at some point, the visible object is decomposed so that the left part becomes invisible, but there is no definite point where this occurs.

2.2.1 **Uncertainty Quasi-Paradox:** Large matter, which is at some degree under the "determinist principle", is formed by a totality of elementary particles, which are under Heisenberg's "indeterminacy principle".

2.2.2 **Uncertainty Sorites Paradox:** Similarly, there is not a clear frontier between the matter under the "determinist principle" and the matter under "indeterminist principle".

2.3.1 **Unstable Quasi-Paradox:** "Stable" matter is formed by "unstable" elementary particles (elementary particles decay when free).

2.3.2 **Unstable Sorites Paradox:** Similarly, there is not a clear frontier between the "stable matter" and the "unstable matter".

2.4.1 **Short-Time-Living Quasi-Paradox:** "Long-time-

living” matter is formed by very “short-time-living” elementary particles.

2.4.2 **Short-Time-Living Sorites Paradox:** Similarly, there is not a clear frontier between the “long-time-living” matter and the “short-time-living” matter.

3 Conclusion

“More such quantum quasi-paradoxes and paradoxes can be designed, all of them forming a class of Smarandache quantum quasi-paradoxes.” (Dr. M. Khoshnevisan, Griffith University, Gold Coast, Queensland, Australia [3])

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